

SEQUENCE LISTING

<110> Wang

<120> Cloning and Characterization of the
Broad-Spectrum Resistance Gene Pi2

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<151> 2003-03-18

<150> 60/409,216

<151> 2002-09-09

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<212> DNA

<213> Oryza minuta

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ctc ggc atc cag aag gag atc tgg tac atc aag gac gag ctg aaa act	144
Leu Gly Ile Gln Lys Glu Ile Trp Tyr Ile Lys Asp Glu Leu Lys Thr	
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att cag gca ttc tta aga gct gct gaa gta aca aag aag aaa gat gac	192
Ile Gln Ala Phe Leu Arg Ala Ala Glu Val Thr Lys Lys Lys Asp Asp	
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ttg cta aag gta tgg gca gag caa gta cga gat ctg tca tat aac att	240
Leu Leu Lys Val Trp Ala Glu Gln Val Arg Asp Leu Ser Tyr Asn Ile	
65 70 75 80	
gaa gat tgc cta gac gaa ttc aag gtt cat gtt gag agc caa agc ttg	288
Glu Asp Cys Leu Asp Glu Phe Lys Val His Val Glu Ser Gln Ser Leu	
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Ala Lys Gln Leu Met Lys Leu Gly Glu Arg His Arg Ile Ala Val Gln	
100 105 110	
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Ile Arg Asn Leu Lys Ser Arg Ile Glu Glu Val Ser Asn Arg Asn Thr	
115 120 125	

cgc tac agc tta atc aag ccc att tcc tct ata acc aca gag gat gag	432
Arg Tyr Ser Leu Ile Lys Pro Ile Ser Ser Ile Thr Thr Glu Asp Glu	
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agg gat tcc tac cta gaa gat gct cgc aat cga tca ggt agc aac act	480
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Asp Glu Ser Glu Leu Val Gly Phe Ala Lys Thr Lys Asp Glu Leu Leu	
165 170 175	
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Lys Leu Ile Asp Val Asn Thr Asn Asp Gly Pro Ala Lys Val Ile Cys	
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Val Val Gly Met Gly Gly Leu Gly Lys Thr Thr Leu Ala Arg Lys Ala	
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Tyr Glu Asn Lys Glu His Met Lys Asn Phe Ser Cys Cys Ala Trp Ile	
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Arg Gln Leu Leu Gly Ala Asp Ser Leu Asp Lys Leu Leu Lys Glu Phe	
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agt gag aag ttg ctc gtg caa gtc cag cat ctc gct gat cac ttg gtt	816
Ser Glu Lys Leu Leu Val Gln Val Gln His Leu Ala Asp His Leu Val	
260 265 270	
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Glu Gly Leu Lys Glu Lys Arg Tyr Phe Val Val Leu Asp Asp Leu Trp	
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acc ata gat gca tgg aat tgg att cat gat att gct ttt ccg aag att	912
Thr Ile Asp Ala Trp Asn Trp Ile His Asp Ile Ala Phe Pro Lys Ile	
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Ala Gly Arg Cys Thr Ser Glu Ser Leu Ile Tyr His Leu Glu Pro Leu	
325 330 335	
cat ata gat gat gct ata cac ttg cta cta gca aag aca aac ata aga	1056
His Ile Asp Asp Ala Ile His Leu Leu Leu Ala Lys Thr Asn Ile Arg	
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Arg Met Val Thr Leu Ser Tyr Asn His Leu Pro Ser His Leu Lys Pro	
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Cys Phe Leu Tyr Leu Ser Ile Phe Pro Glu Asp Phe Glu Ile Gln Arg	
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Gly Arg Leu Val Asp Arg Trp Ile Ala Glu Gly Phe Val Arg Ala Thr	
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485 490 495	
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Val Lys Arg Cys Arg Ile His Asp Ile Met Arg Asp Ile Ile Val Ser	
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Cys Ser Lys Ile Cys Leu Glu Trp Asn His Leu Arg Ser Val Thr Leu	
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Thr Gln Asn Asp Ile Arg Asn Ile Gly Leu Leu Arg His Met Lys Tyr	
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cga tgc agc agg agg tct ggt tct ggt tac ttt agc ata ata gat aat				2016
Arg Cys Ser Arg Arg Ser Gly Ser Gly Tyr Phe Ser Ile Ile Asp Asn	660	665	670	
ccc aag gaa tgc ttg atg atc acc atg tgc tta ccg atg gtt ttc tta				2064
Pro Lys Glu Cys Leu Met Ile Thr Met Cys Leu Pro Met Val Phe Leu	675	680	685	
act tca ata aat ttc agt gac cgt gtg aag tta att cct gag ata tgc				2112
Thr Ser Ile Asn Phe Ser Asp Arg Val Lys Leu Ile Pro Glu Ile Cys	690	695	700	
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Met Ser Cys Ser Thr Arg Trp Ser Asp Thr Lys Gly Val Arg Val Pro	705	710	715	720
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Arg Gly Ile Asp Asn Leu Lys Glu Leu Gln Ile Leu Glu Val Val Asp	725	730	735	
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Gln Leu Arg Lys Leu Ser Val Thr Thr Lys Gly Ala Thr Asn Lys Lys	755	760	765	
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Tyr Gln Ile Phe Cys Ala Ala Ile Glu Lys Leu Ser Ser Leu Gln Ser	770	775	780	
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Leu Arg Val Asp Ala Glu Gly Phe Ser Asp Thr Gly Thr Leu Glu Trp	785	790	795	800
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Leu Asn Ser Ile Ala Cys Pro Pro Pro Phe Leu Lys Arg Leu Lys Leu	805	810	815	
aat gga tct ctt gca gat aca cca aac tgg ttt ggg aac ctt aag cag				2496
Asn Gly Ser Leu Ala Asp Thr Pro Asn Trp Phe Gly Asn Leu Lys Gln	820	825	830	
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Leu Val Lys Met Cys Leu Ser Arg Cys Gly Leu Lys Asp Gly Lys Thr	835	840	845	
atg gag ata ctt ggg gca ctg ccc aac ctt atg gtt ctt cgt ctt tat				2592
Met Glu Ile Leu Gly Ala Leu Pro Asn Leu Met Val Leu Arg Leu Tyr	850	855	860	
cgc aac gca tat gct gac gag aaa atg aca ttc aga agg gga act ttc				2640
Arg Asn Ala Tyr Ala Asp Glu Lys Met Thr Phe Arg Arg Gly Thr Phe	865	870	875	880
cca aat ctc agg tgt ctt gat att tac ttg ctg aag caa ctt aga gag				2688

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Ile	Arg	Phe	Glu	Glu	Gly	Thr	Ser	Pro	Thr	Met	Glu	Ser	Ile	Glu	Ile		
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Tyr	Gly	Cys	Arg	Leu	Glu	Ser	Gly	Ile	Ile	Gly	Ile	Lys	His	Leu	Pro		
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aga	ctt	aag	att	att	tcg	ctt	gaa	tat	gat	ggc	aaa	gtc	gcg	aag	ctt	2832	
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gat	gtg	ctg	caa	gag	gaa	gtg	aat	aca	cac	ccc	aat	cat	act	gaa	ttg	2880	
Asp	Val	Leu	Gln	Glu	Glu	Val	Asn	Thr	His	Pro	Asn	His	Thr	Glu	Leu		
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caa	atg	gca	gag	gat	cga	agt	cat	cat	gac	cta	gga	ggc	ctt	gca	tct	2928	
Gln	Met	Ala	Glu	Asp	Arg	Ser	His	His	Asp	Leu	Gly	Gly	Leu	Ala	Ser		
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gat	ggc	gat	gat	gcc	cat	gac	aat	cca	gcg	ttg	cgc	tat	caa	aca	tca	2976	
Asp	Gly	Asp	Asp	Ala	His	Asp	Asn	Pro	Ala	Leu	Arg	Tyr	Gln	Thr	Ser		
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Cys	*																

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Glu	Asp	Cys	Leu	Asp	Glu	Phe	Lys	Val	His	Val	Glu	Ser	Gln	Ser	Leu	
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Arg	Asp	Ser	Tyr	Leu	Glu	Asp	Ala	Arg	Asn	Arg	Ser	Gly	Ser	Asn	Thr	
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Asp	Glu	Ser	Glu	Leu	Val	Gly	Phe	Ala	Lys	Thr	Lys	Asp	Glu	Leu	Leu	
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Lys	Leu	Ile	Asp	Val	Asn	Thr	Asn	Asp	Gly	Pro	Ala	Lys	Val	Ile	Cys	
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Arg	Gln	Leu	Leu	Gly	Ala	Asp	Ser	Leu	Asp	Lys	Leu	Leu	Lys	Glu	Phe				
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Ser	Glu	Lys	Leu	Leu	Val	Gln	Val	Gln	His	Leu	Ala	Asp	His	Leu	Val				
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Glu	Gly	Leu	Lys	Glu	Lys	Arg	Tyr	Phe	Val	Val	Leu	Asp	Asp	Leu	Trp				
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Thr	Ile	Asp	Ala	Trp	Asn	Trp	Ile	His	Asp	Ile	Ala	Phe	Pro	Lys	Ile				
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His	Ile	Asp	Asp	Ala	Ile	His	Leu	Leu	Leu	Ala	Lys	Thr	Asn	Ile	Arg				
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Cys	Phe	Leu	Tyr	Leu	Ser	Ile	Phe	Pro	Glu	Asp	Phe	Glu	Ile	Gln	Arg				
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Asp	Gly	Val	Asn	Ile	Glu	Asp	Val	Gly	Asn	Ser	His	Phe	Asn	Glu	Leu				
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Val	Lys	Arg	Cys	Arg	Ile	His	Asp	Ile	Met	Arg	Asp	Ile	Ile	Val	Ser				
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Pro	Lys	Glu	Cys	Leu	Met	Ile	Thr	Met	Cys	Leu	Pro	Met	Val	Phe	Leu				
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Thr	Ser	Ile	Asn	Phe	Ser	Asp	Arg	Val	Lys	Leu	Ile	Pro	Glu	Ile	Cys				
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Met Ser Cys Ser Thr Arg Trp Ser Asp Thr Lys Gly Val Arg Val Pro
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 Arg Gly Ile Asp Asn Leu Lys Glu Leu Gln Ile Leu Glu Val Val Asp
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 Ile Asn Arg Thr Ser Arg Lys Ala Ile Glu Glu Leu Gly Glu Leu Ile
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 Gln Leu Arg Lys Leu Ser Val Thr Thr Lys Gly Ala Thr Asn Lys Lys
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 Asn Gly Ser Leu Ala Asp Thr Pro Asn Trp Phe Gly Asn Leu Lys Gln
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 ggc gtc gag aag gac atc tgg tat atc aaa gat gag cta aaa aca atg 144
 Gly Val Glu Lys Asp Ile Trp Tyr Ile Lys Asp Glu Leu Lys Thr Met
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 cag gca ttc ctt aga gct gct gaa gtt atg aaa aag aaa gat gaa cta 192

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Leu	Lys	Val	Trp	Ala	Glu	Gln	Ile	Arg	Asp	Leu	Ser	Tyr	Asp	Ile	Glu	80	
65					70				75								
gat	tcc	ctt	gat	gaa	ttt	aaa	gtc	cat	att	gaa	agc	caa	acc	cta	ttt	288	
Asp	Ser	Leu	Asp	Glu	Phe	Lys	Val	His	Ile	Glu	Ser	Gln	Thr	Leu	Phe	95	
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			100				105										
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Gln Ala Phe Leu Ile Ala Ala Glu Ala Ser Lys Lys Ser Ile Leu Leu
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Lys Val Trp Val Gln Gln Val Arg Asp Leu Ser Tyr Asp Ile Glu Asp
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Cys Leu Asp Glu Phe Thr Val His Val Gly Ser Gln Asn Leu Ser Arg
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Gln Leu Met Lys Leu Lys Asp Arg His Arg Ile Ala Ile Gln Ile Arg
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Asn Leu Arg Thr Arg Ile Glu Glu Val Ser Thr Arg Asn Ile Arg Tyr
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Asn Leu Ile Glu Asn Asp Leu Thr Cys Thr Thr Asp Glu Arg Asn Leu
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Phe Met Glu Asp Ile Arg Asn Gln Ser Ala Asn Asn Ile Glu Glu Ala
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Ile Ser Lys Ala Ala Ser Ala Ala Asp Glu Thr Ser Leu Leu Leu
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ggc gtc gag aaa gac atc tgg tat atc aaa gat gag cta aaa acg atg 144
Gly Val Glu Lys Asp Ile Trp Tyr Ile Lys Asp Glu Leu Lys Thr Met
35 40 45

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Gln Ala Phe Leu Arg Ala Ala Glu Leu Met Lys Lys Lys Asp Glu Leu
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Leu Lys Val Trp Ala Glu Gln Ile Arg Asp Leu Ser Tyr Asp Ile Glu
65 70 75 80

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Asp Ser Leu Asp Glu Phe Lys Val His Ile Glu Ser Gln Thr Leu Phe
85 90 95

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Arg Gln Leu Val Lys Leu Arg Glu Arg His Arg Ile Ala Ile Arg Ile
100 105 110

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His Asn Leu Lys Ser Arg Val Glu Glu Val Ser Ser Arg Asn Thr Arg
115 120 125

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Tyr Ser Leu Val Lys Pro Ile Ser Ser Gly Thr Glu Ile Asp Met Asp
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Ser Tyr Ala Glu Asp Ile Arg Asn Gln Ser Ala Arg Asn Val Asp Glu
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180 185 190

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Lys Leu Gln Gly Leu Gln Thr Leu Asn Met Pro Ser Thr Tyr Ile Ala	
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Ala Leu Pro Ser Glu Ile Ser Lys Leu Gln Cys Leu His Thr Leu Arg	
645 650 655	
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Cys Ile Gly Gln Phe His Tyr Asp Asn Phe Ser Leu Asn His Pro Met	
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Ser	Arg	Gln	Glu	Asn	Phe	Val	Leu	Leu	Pro	Met	Gly	Asp	Gly	Ser	Asp
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Cys	Lys	Thr	Gly	Leu	Asp	Trp	Ser	Ile	Ile	Arg	Ser	Leu	Ala	Ile	Phe
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Gly	Asp	Arg	Pro	Lys	Ser	Leu	Ala	His	Ala	Val	Cys	Pro	Asp	Gln	Leu
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Cys	Ile	Gly	Gln	Phe	His	Tyr	Asp	Asn	Phe	Ser	Leu	Asn	His	Pro	Met
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Thr	Lys	Ser	Cys	Trp	Ser	Glu	Ser	Ile	Gly	Val	Lys	Val	Pro	Lys	Gly
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Ala	Tyr	Leu	Gly	Glu	Lys	Leu	Val	Phe	Lys	Thr	Gly	Ala	Phe	Pro	Asn				
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Ser	Ile	Glu	Val	Gln	Thr	Ala	Asp	Pro	Val	Pro	Asp	Ala	Glu	Gly	Ser				
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Glu	Ser	Ser	Gln	Ser	Gln	Val	Ile	Thr	Leu	Thr	Thr	Asn	Asp	Ser	Glu				
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 tccctgagca agaggagag agcacgcagg aaaaatattc gccatgtagc gtaccatgac 300
 agcaagtgtt ctattatagg c atg gac tgg agc cat gta cgg tcg tta act 351
 Met Asp Trp Ser His Val Arg Ser Leu Thr
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 Leu Phe Gly Asp Glu Arg Pro Lys Glu Leu Ser Pro Pro Phe Cys Ser
 15 20 25

ccc caa ttg aaa atg cta agg gtg ctg gat cta cta gat att ata ttt 447
 Pro Gln Leu Lys Met Leu Arg Val Leu Asp Leu Leu Asp Ile Ile Phe
 30 35 40

gga cta gca aaa aga tat gga taa aatatgggtt ttgcgtcact tgaaatatgt 501
 Gly Leu Ala Lys Arg Tyr Gly *
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gatacatata atcgtaagga atgtgtactt attttatcac gtattccttt gattatggct 741
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atc agc aag gcc gcc tcc gcc gct gcc gac gag acc agc ctc ctg ctc 96
Ile Ser Lys Ala Ala Ser Ala Ala Asp Glu Thr Ser Leu Leu Leu
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ggc gtc gag aaa gac atc tgg tac ttg ttt aga cat ggt gtt gga cgg 144
Gly Val Glu Lys Asp Ile Trp Tyr Leu Phe Arg His Gly Val Gly Arg
          35          40          45

tcg aat ggt ggg cct gtt gta ggt atg gtg gca tct ggc aac cag tca 192
Ser Asn Gly Gly Pro Val Val Gly Met Val Ala Ser Gly Asn Gln Ser
          50          55          60

tgc tta gca ata gat tcc tat gca gaa gac att cgc aat caa tca gct 240
Cys Leu Ala Ile Asp Ser Tyr Ala Glu Asp Ile Arg Asn Gln Ser Ala
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cga aat gtg gat gaa gct gag ctt gtt ggg ttt tct gac tcc aag aaa 288
Arg Asn Val Asp Glu Ala Glu Leu Val Gly Phe Ser Asp Ser Lys Lys

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Val	Ile	Cys	Val	Val	Gly	Met	Gly	Gly	Leu	Gly	Lys	Thr	Ala	Leu	Ser					
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Asp	Asp	Leu	Trp	Ile	Leu	His	Asp	Trp	Asn	Trp	Ile	Asn	Glu	Ile	Ala					
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Asn	Val	Asp	Leu	Ala	Glu	Lys	Cys	Ala	Thr	Ala	Ser	Leu	Val	Tyr	His					
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Lys	Phe	Tyr	Glu	His	Leu	Pro	Ser	Glu	Leu	Glu	Ile	Asn	Pro	Ser	Leu					
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gaa	gct	ttg	agg	aga	atg	gtg	acc	cta	ggg	tac	aac	cac	cta	cca	tcc	1056				

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His Leu Lys Pro Cys Phe Leu Tyr Leu Ser Ile Phe Pro Glu Asp Phe	
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Val Arg Pro Lys Val Gly Met Thr Thr Lys Asp Val Gly Glu Ser Tyr	
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Phe Asn Glu Leu Ile Asn Arg Ser Met Ile Gln Arg Ser Arg Val Gly	
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Ile Ala Gly Lys Ile Lys Thr Cys Arg Ile His Asp Ile Ile Arg Asp	
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Ile Thr Val Ser Ile Ser Arg Gln Glu Asn Phe Val Leu Leu Pro Met	
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Gly Asp Gly Ser Asp Leu Val Gln Glu Asn Thr Arg His Ile Ala Phe	
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His Gly Ser Met Ser Cys Lys Thr Gly Leu Asp Trp Ser Ile Ile Arg	
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Ser Leu Ala Ile Phe Gly Asp Arg Pro Lys Ser Leu Ala His Ala Val	
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Cys Pro Asp Gln Leu Arg Met Leu Arg Val Leu Asp Leu Glu Asp Val	
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Thr Phe Leu Ile Thr Gln Lys Asp Phe Asp Arg Ile Ala Leu Leu Cys	
515 520 525	
cac ttg aaa tac ttg agt att gga tat tcg tca tcc ata tat tca ctt	1632
His Leu Lys Tyr Leu Ser Ile Gly Tyr Ser Ser Ile Tyr Ser Leu	
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Pro Arg Ser Ile Gly Lys Leu Gln Gly Leu Gln Thr Leu Asn Met Pro	
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Ser Thr Tyr Ile Ala Ala Leu Pro Ser Glu Ile Ser Lys Leu Gln Cys	
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Leu His Thr Leu Arg Cys Ser Arg Lys Phe Val Ser Asp Asn Phe Ser	
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725 730 735	
ctc gtg ttg tat gga agt ctt gaa gag atg cct aac tgg att gag cag	2256
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755 760 765	
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Gly Lys Thr Met Leu Ile Leu Gly Ala Leu Pro Asn Leu Met Val Leu	
770 775 780	
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Asp Leu Tyr Arg Lys Ala Tyr Leu Gly Glu Lys Leu Val Phe Lys Thr	
785 790 795 800	
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Gly Ala Phe Pro Asn Leu Arg Thr Leu Ser Ile Tyr Asp Leu Asp Gln	
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Ile Glu Ile Arg Phe Cys Arg Leu Glu Ser Gly Ile Ile Gly Ile Ile	
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His Leu Pro Arg Leu Lys Glu Ile Ser Leu Gly Tyr Glu Ser Lys Val	
850 855 860	
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Ala Gly Leu Ala Gln Leu Glu Gly Glu Val Arg Thr His Pro Asn His	
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ccc gtg ctg cga aag agg gag gac cga agt gat cac gac ctt gct tgt	2688
Pro Val Leu Arg Lys Arg Glu Asp Arg Ser Asp His Asp Leu Ala Cys	
885 890 895	
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Asp Ala Glu Gly Ser Pro Val Glu Val Glu Ala Thr Asp Pro Leu Pro	
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Glu Gln Glu Gly Glu Ser Ser Gln Arg Arg Asp Lys His Ser Ser Ser	
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Trp Phe Tyr Gln Val Met Ile Ser Ser Ser Ile Gly Ile Ser Gly Arg	
930 935 940	
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Pro Cys Phe Cys Gly Cys Ala His Leu Ala Val Pro Arg Arg Gly Ala	
945 950 955 960	
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965 970 975	
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Ser Ser Leu Ser Gly Met Asn Cys Phe Asn Leu Thr Phe Ser Arg Asp	
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 35 40 45
 Ser Asn Gly Gly Pro Val Val Gly Met Val Ala Ser Gly Asn Gln Ser
 50 55 60
 Cys Leu Ala Ile Asp Ser Tyr Ala Glu Asp Ile Arg Asn Gln Ser Ala
 65 70 75 80
 Arg Asn Val Asp Glu Ala Glu Leu Val Gly Phe Ser Asp Ser Lys Lys
 85 90 95
 Arg Leu Leu Glu Met Ile Asp Thr Asn Ala Asn Asp Gly Pro Ala Lys
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 Val Ile Cys Val Val Gly Met Gly Gly Leu Gly Lys Thr Ala Leu Ser

Glu Leu His Met Ala Thr Lys Ser Cys Trp Tyr Lys Ser Phe Gly Val
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 Lys Val Pro Lys Gly Ile Gly Lys Leu Arg Asp Leu Gln Val Leu Glu
 645 650 655
 Tyr Val Asp Ile Arg Arg Thr Ser Ser Arg Ala Ile Lys Glu Leu Gly
 660 665 670
 Gln Leu Ser Lys Leu Arg Lys Leu Gly Val Met Thr Asn Gly Ser Thr
 675 680 685
 Lys Glu Lys Cys Lys Ile Leu Cys Ala Ala Ile Glu Lys Leu Ser Ser
 690 695 700
 Leu Gln Tyr Leu Tyr Val Asn Ala Ala Gly Ile Ser Asp Gly Gly Thr
 705 710 715 720
 Leu Glu Cys Leu Asp Ser Ile Ser Ser Pro Pro Pro Leu Leu Arg Thr
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 Leu Val Leu Tyr Gly Ser Leu Glu Glu Met Pro Asn Trp Ile Glu Gln
 740 745 750
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<210> 14
<211> 1214
<212> DNA
<213> Oryza minuta

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<220>
<221> misc_feature
<222> 806, 835, 891, 906, 946, 964, 970, 991, 997, 1018, 1060,
1091, 1125, 1129, 1131, 1148
<223> n = A,T,C or G

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<210> 15
<211> 2422
<212> DNA
<213> Oryza minuta

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<220>
<221> misc_feature
<222> 2014, 2043, 2099, 2114, 2154, 2172, 2178, 2199, 2205, 2226,
2268, 2299, 2333, 2337, 2339, 2356
<223> n = A,T,C or G

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